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SUPERHEATERS.

Superheat, Superheating, and their Control. By William H. Booth. Pp. xv+155. (London: A. Constable and Co., Ltd., 1907.) Price 6s. net.

THE constant reiteration of one maker's name in the book before us is wearisome, and we are agreed that "Connected as the author is with the only type of superheater using water-control in inner tubes he is not unnaturally apt to favour that system somewhat" (p. 143). He does this to the extent of twenty-two full pages of illustrations, &c., out of the 155 composing the book, besides further references on nine more!

The author thinks regulation of the temperature of the steam most important, and mentions seven ways of accomplishing this end. Prof. Unwin, however, has expressed scepticism as to this necessity "*provided only the superheaters were properly placed*"; an opinion in which he was supported by the late Mr. Bryan Donkin.¹

The author considers Lancashire and similar boilers suitable for combining with superheaters, but for "average water-tube boilers," whatever this may mean, and marine boilers he recommends separately fired superheaters.

The inventor of one of the most widely used superheaters, especially for locomotive work, is referred to as "one Schmidt," and *two* locomotives are stated to have been fitted with his system with good results! While crediting another system with having been fitted or ordered for 372 locomotives, he gives no description. Describing another in some detail, he says nothing of its performance, or, indeed, whether it is in use. Only two other superheaters are illustrated. Particulars of two tests only are given, made with "Cruse" and "Foster" superheaters respectively.

Although he works out the area of a "theoretical diagram" to one ten-thousandth of a square inch (!) the author is less particular about other matters. For instance, the specific heats of several of the substances in a table on p. 8 do not agree with those on p. 148. In a curious calculation on p. 16 he concludes that a pound of steam at 361° F. will raise 60 pounds of cast iron from 62° to 361°. Taking the value of the specific heat of cast iron = 0.11, as given on this page (two other values are given elsewhere), 1973 B.Th.U.² are required to effect this. As each pound of steam can only supply 1192 B.Th.U., even if cooled to 32°, the author expects to get more heat out of the steam than it contains.

In attacking what he calls "The Leakage School" he is apparently unaware that serious leakage is usually only attributed to engines with flat slide valves; and not, therefore, to those designed for use with superheated steam. Captain Sankey has demonstrated in a masterly manner that properly designed piston valves are practically steam-tight.

On p. 29 the well-known expression $PV^{1.065}$ is printed $PS^{1.065}$; an unfortunate departure, as "S" has

¹ Proc. Inst. Mech. Engineers, 1896.

² $(0.361^2 - 62^2) \times 0.11 \times 60 = 1973$.

another meaning on p. 33. Another loose expression is the use of the term "thermometric" heat for a quantity measured in B.Th.U.

On p. 34, the first equation is hopelessly wrong. A formula at the bottom of the same page, for converting the actual evaporation of a boiler to its equivalent weight of water "from and at 212," is only correct if the steam is saturated and dry; yet we read on p. 46 "No boiler delivers dry steam."

Notwithstanding the author's statement that he "prefers not to write a book of the catalogue-compilation type," he has, in our opinion, failed to give any information which would be useful to a designer, or, indeed, to anyone but a prospective customer.

The publishers have produced the book in their usual excellent style, but there are one or two instances of American spelling which have apparently escaped the reader's notice.

A BAVARIAN TEXT-BOOK OF BOTANY.

Lehrbuch der Botanik für Oberrealschulen und Realschulen. By Dr. Th. Bokorny. I. Teil. Pp. vi+366. Price 4 marks. II. Teil. Pp. 223. Price 3 marks. (Leipzig: W. Engelmann, 1908.)

A REDEEMING feature of the large number of botanical text-books published during the last few years has been the freshness, in some cases the originality, of treatment which has from time to time characterised them. The volumes now under notice constitute a case in point. The reorganisation and extension of botanical teaching in the Realschulen and Oberrealschulen of Bavaria has rendered the existing text-books unsuited to the changed ideas, and in the present volumes Prof. Bokorny has produced a text-book which aims at directing, upon right lines, the efforts of those entrusted with the new teaching.

The author's treatment of his subject is of some interest to teaching botanists. The first section of part I., occupying nearly one-half of the volume, is concerned with a description, in almost non-technical but very direct language, of representative plant species from the phanerogams downwards, the flowering plants receiving by far the greatest attention. At convenient intervals in these descriptions the author deals with a topic of special interest—not necessarily bearing upon the preceding subject-matter—particular examples being the influence of soil conditions upon plant life, the relationships between plants and insects in the pollination processes, distribution of fruits and seeds, and the influence of light upon plant growth. An almost inevitable accompaniment of this system is a certain discontinuity of text which is occasionally striking, but there can be little doubt that the method should quickly arouse the interest of the student, and found it, from the beginning, upon an extended basis. The plants chosen for description are invariably such as should be familiar to students who are no longer beginners, and a welcome departure from established custom is the inclusion of plants of economic importance. The descriptions are largely concerned with floral characters, and are brief and well-written.

The first section of the book, together with an out-

line of the essential points of plant anatomy and histology, may be regarded as preparatory to the more serious systematic study of the vegetable kingdom contained in section iii. As might be expected, Prof. Bokorny has adopted the Englerian scheme of classification, but reference is made to other systems, the Linnean system being considered, in a special chapter, at greater length perhaps than is desirable at the present day. The greater part of the section is devoted to the principal orders of phanerogams; and in his emphasis of well-chosen points of taxonomic importance and frequent references to plants of economic and biological interest, the author has produced a very clear and readable exposition of a branch of botany notoriously difficult to deal with in a manner which shall arouse and, more especially, sustain the interest of the student.

The question of general morphology is dealt with in the first section of part ii. Both the stage at which this important branch of botany is considered and the relatively small amount of space allotted to it—some twenty pages largely occupied by illustrations—would probably meet with criticism at the hands of most English botanists, and the same may be said with regard to the comparatively little attention paid to anatomy. But the principal features of part ii. are the sections dealing with physiology and ecology. In the latter section the author prefers the primary title of "*Biologie der Pflanzen*"; the various factors influencing plant life are first considered in some detail, and the actual studies of typical formations are concerned with the vegetation of the earth as a whole rather than with a detailed consideration of more restricted areas, a method more generally adopted in this country.

A feature of the book is the wealth of illustrations with which it is provided. Most of them are familiar friends, but they are drawn from very varied sources, and the inclusion of many of them is a further example of the freshness of conception which has been already commented upon as characterising these volumes.

OUR BOOK SHELF.

Dæmringen i Norge. By Prof. H. Mohn. Pp. 76. (Christiania: Jacob Dybwad, 1908.)

IN a country which stretches, as Dr. Mohn reminds us, to the 71st degree of north latitude, the times of sunrise and sunset, with the accompanying phenomena of twilight, have a wider significance than with us. There the calendar has to be consulted to find the day when the sun will first appear above the horizon, while the amount of light received when the sun is a definite distance below the horizon has a distinct economic value. Even the azimuth at which the sun will rise or set is not altogether a negligible quantity. Considerations of this kind have led Prof. Mohn to submit the question of twilight to a very close investigation, and to furnish tables which will enable an inhabitant of these northern regions to gauge very accurately how much direct or reflected sunlight he may expect. No doubt Prof. Mohn is well advised from a practical point of view, but in some respects his tables seem to aim at a greater

degree of accuracy than can be of service. In such questions as the effect of temperature on refraction, or the amount of reflected light, the variables arising from clouds and state of the sky generally would upset the nicety of the calculations. But so far as the convenience of the tables is concerned, and the thoroughness with which the theory is presented, there is nothing left to be desired, and it is not surprising if those who have not lived in a country where the economy of the winter light is a matter of importance fail to appreciate the necessity of this accuracy.

Prof. Mohn recognises four distinct steps in the approach of night or dawn. (1) The true time of geometrical sunrise or sunset when the sun's upper limb is on the astronomical horizon, or $Z_1 = 90^\circ + r - \pi + \rho$, where ρ is the refraction, r the sun's radius, and π the parallax. (2) The beginning and end of the gloaming (*Skumringens Ende*), when the sun's centre is 4° below the horizon. In clear weather in Norway, indoor work is possible under these conditions. Bright stars begin to appear in the sky. Sirius is visible when the sun is three degrees below the horizon. (3) It is more difficult to understand what is meant by the end of twilight. It is the time when daylight decreases most rapidly, and is described as the time when, in a clear sky, print can be read with difficulty if the light from the illuminated part of the sky is allowed to fall on the page, or when some kinds of outside work may be carried on. As a matter of computation, the time is decided by increasing the zenith distance of the sun, given in the first case by small angles depending on the atmospheric refraction, making the sun's zenith distance about 98° . (4) The last stage is that of complete night, or the time when the earth's atmosphere receives no light from the sun. The sun is then about 17° below the horizon. This scheme is a great practical advance on the method adopted in this country, where an arbitrary zenith distance of 108° is accepted as that at which night begins or ends. Tables are given for extending the calculations to other latitudes, and would make them available in the Shetland Isles and North Scotland.

Maryland Weather Service. Vol. ii. 1907. Pp. 515; illustrated. (Baltimore: The Johns Hopkins Press, 1907.)

THIS volume contains a report on the climate and weather of Baltimore and vicinity, prepared by Dr. O. L. Fassig under the direction of Prof. W. L. Moore, chief of the United States Weather Bureau; it is based on observations of the latter service since 1871, supplemented by all available records, both public and private, extending over a period of nearly a century. Meteorologists owe a debt of gratitude to the board of control of the Maryland Weather Service, and to Dr. Fassig especially, for one of the most complete and valuable meteorological discussions extant. Part i., which occupies more than half the volume, deals with climatic factors, each element being considered, so far as possible, with reference to its annual and diurnal periods and its variability; the statistical tables are supplemented by the usual range diagrams and also by isopleths, the principle of which was devised many years ago by M. Léon Lalanne. Although not frequently employed, the latter method exhibits in a concise and intelligent way the successive changes throughout the year. The value of this section of the work is much enhanced by careful discussion of the results obtained and of the interaction of the various elements, by references to the present state of our knowledge and to generally accepted theories.